Supplementary information for

Controlling the degradation of cellulose scaffolds with Malaprade oxidation for tissue engineering

Wichchulada Chimpibul\textsuperscript{a,b}, Tadashi Nakaji-Hirabayashi\textsuperscript{c}, Xida Yuan\textsuperscript{b}, Kazuaki Matsumura*\textsuperscript{b}

\textsuperscript{a}Program in Biotechnology, Faculty of Science, Chulalongkorn University, Bangkok, Thailand

\textsuperscript{b}School of Materials Science, Japan Advanced Institute of Science and Technology, Ishikawa, Japan

\textsuperscript{c}Faculty of Engineering Department of Environmental Applied Chemistry, University of Toyama, Toyama, Japan

*Corresponding Author: Kazuaki Matsumura, School of Materials Science, Japan Advanced Institute of Science and Technology, Ishikawa, Japan; e-mail: mkazuaki@jaist.ac.jp
Figure S1. SEM photographs of the cellulose scaffold structure after leaching. The scaffolds contained different percentages of NaCl particles with a size of 250 μm: (A) 60%, (B) 50%, (C) 40%, and (D) 30%.
Table S1 Pore size of cellulose scaffolds prepared using 50 wt% of NaCl crystals as porogens.

<table>
<thead>
<tr>
<th>NaCl particle size/µm</th>
<th>Pore size before oxidation / µm</th>
<th>Pore size after oxidation by NaIO₄ (1.0%)/µm</th>
</tr>
</thead>
<tbody>
<tr>
<td>52</td>
<td>54±4.8</td>
<td>58±9.9</td>
</tr>
<tr>
<td>75</td>
<td>84±5.5</td>
<td>79±10.6</td>
</tr>
<tr>
<td>100</td>
<td>124±11.3</td>
<td>131±20.8</td>
</tr>
<tr>
<td>150</td>
<td>210±23.5</td>
<td>199±12.6</td>
</tr>
<tr>
<td>250</td>
<td>248±21.0</td>
<td>266±31.5</td>
</tr>
</tbody>
</table>

Table S2 Pore size of cellulose scaffolds prepared using 30, 40, 50, 60 wt% of NaCl crystals with a size of 250 µm as porogens.

<table>
<thead>
<tr>
<th>NaCl particle (250 µm size) concentration/wt%</th>
<th>Pore size before oxidation / µm</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>122±25.6</td>
</tr>
<tr>
<td>40</td>
<td>188±17.3</td>
</tr>
<tr>
<td>50</td>
<td>248±21.0</td>
</tr>
<tr>
<td>60</td>
<td>283±32.6</td>
</tr>
</tbody>
</table>

Table S3 Porosity of cellulose scaffolds

<table>
<thead>
<tr>
<th>Porosity / %</th>
<th>NaCl particle (250 µm size) concentration / wt%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30</td>
</tr>
<tr>
<td>Before oxidation</td>
<td>54.2±3.3</td>
</tr>
<tr>
<td>After oxidation by NaIO₄ (1.0%)</td>
<td>55.4±4.5</td>
</tr>
</tbody>
</table>
Table S4. Aldehyde introduction to cellulose scaffolds.

<table>
<thead>
<tr>
<th>% NaIO₄ introduced to cellulose scaffold</th>
<th>mmol aldehyde/weight (mmol/g)</th>
<th>% aldehyde introduction /glucose unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>0.056</td>
<td>0.91±0.04</td>
</tr>
<tr>
<td>0.2</td>
<td>0.080</td>
<td>1.30±0.02</td>
</tr>
<tr>
<td>0.3</td>
<td>0.117</td>
<td>1.90±0.28</td>
</tr>
<tr>
<td>0.5</td>
<td>0.346</td>
<td>5.61±0.48</td>
</tr>
<tr>
<td>1.0</td>
<td>0.640</td>
<td>10.4±1.75</td>
</tr>
<tr>
<td>2.5</td>
<td>0.913</td>
<td>14.8±2.98</td>
</tr>
<tr>
<td>5.0</td>
<td>1.34</td>
<td>21.7±1.02</td>
</tr>
<tr>
<td>10.0</td>
<td>2.06</td>
<td>33.4±3.88</td>
</tr>
<tr>
<td>15.0</td>
<td>2.33</td>
<td>37.7±3.56</td>
</tr>
<tr>
<td>20.0</td>
<td>2.67</td>
<td>43.3±5.32</td>
</tr>
</tbody>
</table>
Figure S2. Ald-Cel scaffold degradation in 5% glycine solution over a period of 8 weeks.

Data represent mean ± standard deviation (N = 3).
**Figure S3.** Changes in body weight of rats after implantation. The error bars indicate SD (N = 6).